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STUDIES OF THE COMMUNICATION PROCESSES OF RETARDED AND NORMAL MALES.

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THE RESEARCH CONTAINED IN THIS REPORT INCLUDED TWO STUDIES--(1) OPERANT PREFERENCE FOR RATE OF NARRATION AND (2) ORAL READING, SILENT READING, AND SPEAKING RATES. THE FIRST STUDY WAS BASED ON A DOCTORAL DISSERTATION FOR WHICH OPERANT-CONDITIONING TECHNIQUES AND CONJUGATE REINFORCEMENT WERE APPLIED IN RECORDING PREFERENCES FOR NARRATIVE RATE. THE SAMPLE CONSISTED OF 10 NORMAL AND 10 RETARDED MALE SUBJECTS, RANGING IN AGE FROM 10 TO 14 YEARS. THE FINDINGS INDICATED THAT (1) FOR THE CONTINUOUS PRESENTATION OF STIMULI, SPECIFIC PREFERENCES PREVAILED FOR NARRATION AT A CERTAIN RATE AND (2) A DISCREPANCY MAY EXIST BETWEEN OPERANT AND VERBAL PREFERENCES. THE SECOND STUDY ASSESSED THE THREE ADDITIONAL COMMUNICATIVE ELEMENTS. THE SUBJECTS WERE 10 NORMAL AND 9 RETARDED MALES BETWEEN THE AGES OF 10 AND 14 YEARS. THE FINDINGS INDICATED A LACK OF CONSISTENT PERFORMANCE BETWEEN AND AMONG GROUPS. IN ADDITION, EACH COMMUNICATIVE PARAMETER (READING, SPEAKING, AND LISTENING) WAS FOUND TO BE UNDER DIFFERENT STIMULUS CONTROL. (RS)

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PREFACE

The research contained in this report includes two studies, Operant Preference of Retarded and Normal Males for Rate of Narration and Oral Reading, Silent Reading, and Speaking Rates of Normal and Retarded Males.

The first study is based on a doctoral dissertation completed under the direction of Dr. J. O. Smith and Dr. O. R. Lindsley at the University of Kansas. Portions of this research were presented at the regional Council for Exceptional Children Convention held in Wichita, Kansas, in 1965 and the national American Association on Mental Deficiency Convention held in Chicago, Illinois, in 1966.

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OPERANT PREFERENCE OF RETARDED AND NORMAL MALES FOR RATE OF NARRATION

Many researchers have recognized the importance of studying the listening process. A great number of their investigations have been directed toward difficulty of material, speaker style, and levels of intelligence as independent variables and the subsequent effect of these variables on the listener's comprehension. Others have been concerned with rate of presentation as an independent variable.

Several early studies in rate of presentation (Goldstein, 1940; Nelson, 1948; Harwood, 1955) programmed narrative passages up to 285 wpm and found that, although the comprehension of most subjects declined, presumably as a result of higher wpm rates, the loss was not of a significant nature.

Since the rates used by these researchers had minimally affected the comprehension of the listeners, experimentation to assess individual tolerance for more distorted and increased rates of presentation was undertaken.

Miller and Licklider (1950) studied the articulation of spoken, phonetically balanced words under varying conditions of interruptions and reported that high intelligibility persisted even after considerable loss of a stimulus word. Garvey (1953), on the basis of the Miller and Licklider data, reasoned that it would be feasible to cut out manually small segments of the speech sound and present the remainder, thereby decreasing the listening period, yet leaving the original frequency and timbre of presentation unaltered. He presented spondaic words singularly and found that it was possible to compress speech up to 2.5 times without losing more than 20 percent of intelligibility.

The concept of the excess duration of sounds was further validated by Fairbanks et al. (1954), who arbitrarily cut and spliced a magnetic tape. It was discovered that substantially more than 50 percent of the total time of connected speech could be discarded by manual manipulation without destroying intelligibility.

Realizing the possibilities of speeded speech and the limitations of a manual compression technique, Fairbanks, Everitt, and Jaeger developed an electronic device designed to alter the compression of spoken discourse. Fundamentally, the concept depends upon the fact that the duration of the average speech element or phoneme of connected speech exceeds by a considerable margin the minimum duration necessary for its perception by a listener. With this compression apparatus it was possible to assess the effects on comprehension of much faster rates than were possible with the research that involved paced speakers in speeds up to about 285 wpm.

Fairbanks et al., using compressed narration, wrote a series of articles on rate compression and comprehension. The initial research (1957a) was concerned with determining the variation of comprehension at several levels of compression up to 70 percent. The experimenters found that at 60 percent compression (353 wpm) listener response was about 50 percent of maximum, but at 50 percent compression (282 wpm) response was almost 90 percent of maximum.

In a second investigation (1957b) they studied the relationship of listening rate to selective verbal redundancy by using a short version of narration and a longer version, identical except that at two segments of the tape, restated or paraphrased material was inserted. The two versions were compressed to 30 and 50 percent and then presented to the subjects.

The results indicated that the experimental group which had listened to the long version (added text) had an increased response rate at both the 30 and 50 percent compression levels.

The third experiment (1957c) involved comprehension of repeated high-speed messages. The control subjects heard a single message at 0 and 50 percent compression, whereas the experimental group listened to a double message. Comprehension was assessed for both groups under the two treatments, and it was reported that the effect of double presentation facilitated comprehension at both compressions.

More recently Foulke et al. (1962) investigated speech compression as an approach to teaching the blind. Their research arose in response to the severe receptive handicap of the blind. The mean reading rate of the subjects in their study, for example, was only 57 wpm for scientific material and 70 wpm for literary works as contrasted to the median silent reading rate for sighted seventh graders of 215 wpm.

In this study Foulke reported that when the subjects were tested for comprehension at rates up to 375 wpm, there was only a slight loss of comprehension for literary material when words were presented at 225 wpm as compared to control subjects reading Braille. There was, however, no significant loss in comprehension of the scientific material at 275 wpm.

Foulke (1964a) and his associates also explored retention by blind subjects of material presented at compressed word rates. A two-factor research experiment was performed in which word rate and retention interval were varied. The word rates presented were 175, 225, 275, and 325 wpm while the retention intervals were 0, 7, and 30 days. Their results revealed an overall significance for both independent variables and for their inter-

action, leading to the conclusion that the retention of material learned by listening to compressed speech was no different from the retention of material presented at a more conventional rate.

In view of the fact that most subjects have been able to comprehend auditory material delivered to them at faster than normal rates and that noticeable individual differences in the relationship of comprehension ability to narrative speed have been observed it was the aim of the present research to assess individual preferences for narrative rate.

If we are to regard listening as a behavior--a property determined by an individual history of differential reinforcement--each of us perhaps possesses a unique preference as to narrative rate. It is quite conceivable that although most individuals are more stimulated by speech at the normal speech rate, others may prefer a rate somewhat faster or slower than normal.

The tactic or methodology used in the present project to assess narrative rate preference was conjugate reinforcement.

Since conjugate or continuous reinforcement permits a direct and immediate record of the subject's behavior over a time span, the investigator is able to obtain a specific analysis of any moment-to-moment change in the value of the reinforcing stimulus. With the use of a hand microswitch converting presses of a switch into electrical impulses that in turn briefly increase the intensity of continuously available narration, it is possible to record directly the moment-to-moment changes in the reinforcing power of an auditory stimulus.

Lindsley has used the conjugate methodology to measure operant behavior during anesthesia recovery (1961), the depth and duration of EST coma (1962), television viewing (1962a), psychopharmacologic responses (1962b), and communication during psychiatric admission interviews (1964).

Lindsley's research most pertinent to the present attempt to assess narrative rate preferences, however, involved the dual offering of stereophonic and monophonic music in a preference situation (Morgan and Lindsley, 1964). The subjects in this study were placed individually in an enclosed room, supplied with hand switches, and told that they would be listening to music. Nothing was told the subjects concerning the reinforcement contingencies--whether they should press the hand switch or at what rate, although a rate of 60 responses per minute was required to maintain maximum volume. The procedure involved the simultaneous offering of the two dimensions of music, which were programmed by a conjugate servo. Since subject-responding via the hand switch was converted to electrical resistance that in turn determined the type of auditory offering, each individual was able to select the music of his choice. Two of the four subjects demonstrated clear operant preferences for stereophonic music, whereas the other two showed no particular preference. However, when questioned as to their preference, all four verbally stated a preference for stereophonic over monophonic presentation.

Lovitt, by using the conjugate technique to compare narrative stimuli, reported that with a heterogeneous group of boys (1965) abstruse as well as conventional narration was more reinforcing than silence. In a second study involving the continuous offering of two stories to a group of 12-year-olds (1966), it was possible to determine not only the story that was preferred, but the amount this preference represented.

METHOD

Subjects. The subjects in this experiment consisted of ten normal and ten retarded male subjects from the public schools in Northeast Johnson County, Kansas.

In addition to being enrolled in public school classes, the subjects met the following conditions: (a) they were between the ages of ten and fourteen, (b) were free of major hearing impairments which might limit the reception of the narrative material, (c) were free of physical impairments which would hinder manipulation of the apparatus.

The age range of the retarded subjects was from 10-0 to 13-10 with a mean CA of 12-2. Their IQ range, as assessed by either the Stanford-Binet or WISC, was from 50-88, with a mean of 71.

The normal subjects had a mean CA of 12-3, with a range of 11-11 to 12-8. The IQ scores for these boys, obtained from Otis group assessments, ranged from 114-137 with a mean of 121.6.

All of the subjects involved in the research were transported to and from the laboratory by the investigator for at least five sessions. For their participation each was paid $1.50 per hour.

Experimental Instrumentation. Each subject was supplied with Grason-Stadler TDH-39 headphones and given a hand switch (Grason-Stadler model E-800-6) to hold.

The hand switch, when pressed, produced a brief electric charge that affected the narrative intensity. Even if the switch was pressed and held down, only this brief intensity change resulted. The response definer converted each of these hand switch presses into electrical pulses that in turn operated the conjugate reinforcer (Behavioral Research Laboratory,

model CR2S). The rate of responding required to maintain maximum preset volume of 45 responses per minute was programmed with an E1100H timer.

Each listener's operant response rate was recorded on a Gerbrands cumulative recorder. This equipment comprises a roll of paper moving continuously at 30 centimeters (about 12 inches) per hour and a pen that by an upward movement records each hand switch response. After 500 of these recorded responses, the pen automatically resets and the moving process is repeated. The slope of the line on these cumulative records indicates the rate of pressing the handswitch, a steep slope indicating rapid responding and a smooth slope indicating continuous responding.

The tape recorders used in this experiment to supply the narrative reinforcement were two Wollensaks, model T-1500.

The examiner in an adjoining room controlled the response recording equipment, two tape recorders, and also arranged the conjugate contingencies. A schematic diagram of the apparatus is given in Figure 1.

Experimental Procedure. Each subject was seated alone in an enclosed room. He was furnished with headphones and asked to hold a hand switch in his preferred hand. Each was told only that he would be listening to stories and could press the switch if he so desired. Nothing was told him about the reinforcement contingencies--whether he had to press the switch, or if so, at what rate.

During the first experimental session, each subject was initially exposed to the story, White Falcon, at a compressed rate of 25 percent (240 wpm) as opposed to the same story expanded at 25 percent (120 wpm). In order to account for any positional factors affecting the preference on the part of the subjects because of presentation order, a rather elaborate

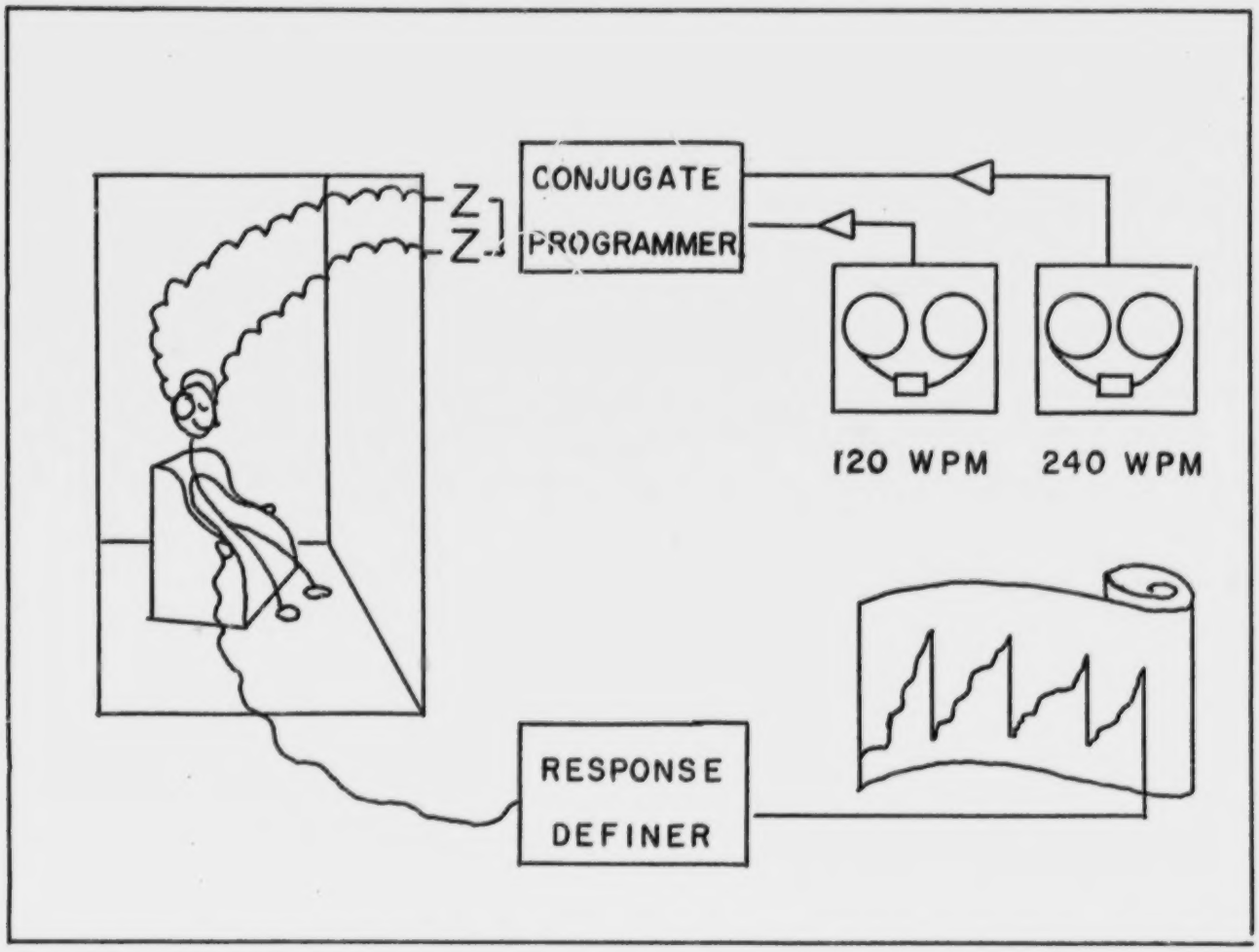

Fig. 1. One-operandum apparatus used to assess individual preference for narrative rate.

scheme of segment counterbalancing was employed. The segments within the first session were as follows:

120	240	120	240	120	240
∠	∠	∠	∠	∠	∠
240	120	120	240	240	120

The symbols 240 and 120 stand for the wpm rates of the presentation. The top symbol refers to accelerating conditions, whereby the subject must respond via the hand switch at the preset rate of 45 responses per minute to attain the narration at its maximum volume. Responding at a rate less than 45 presses per minute granted both narrative rates at minimal volume, and no responding granted the alternate narration. The bottom symbol refers to the decelerating contingency whereby the subject need not respond to be granted narration programmed under those conditions.

During segment one of the first session, if the subject preferred the story at 120 wpm, he had to respond at the prescribed rate. If, however, he desired the story at 240 wpm, he need not respond.

When the subject had displayed a fairly consistent or stable form of behavior during segment one, the contingencies were reversed during segment two. The procedure of allowing the subject time to stabilize his response behavior before continuing to the next segment prevailed throughout each experimental session.

During segments one, two, five, and six, if the subject responded at a rate of more than 45 per minute, or did not respond at all, he heard only one form of narration. If, however, he responded at a rate less than 45 per minute, he heard portions of both presentations, neither at maximal volume. During the control segments (three and four) the subject heard only the one narrative rate. He was granted the same stimulus if he responded or if he chose not to respond.

After the initial comparison, each subject was then involved in at least four more experimental sessions, each lasting from 30 to 45 minutes. During these sessions, preferences were individually obtained for the normal speech rate (180 wpm) versus the 120 wpm rate, 180 or the 240 wpm rate, 120 or 90 wpm, and 240 or 360 wpm. If, after these five sessions, a subject had rejected both of the rate extremes, 360 and 90 wpm, a preference for the remaining three rates, normal (180 wpm), 120, or 240 wpm was ascertained. For those subjects, however, who evidenced preferences for either of the narrative extremes, 360 or 90 wpm, further sessions were run. During these sessions the subjects were presented with 360 or 90 wpm, depending upon the prior preference, with all other preferences. For example, if during the five experimental sessions a subject had indicated preferences for 240 over 120 wpm, 180 over 120 wpm, 180 over 240 wpm, 120 over 90 wpm, and 360 over 240 wpm, he would be run through two more sessions. These additional sessions involved the presentation of the 360 wpm rate with the 120 and 180 wpm rates. If, in our example, the 240 wpm rate had been preferred to the 360 wpm, these final two sessions would not have been necessary. The strongest preference would have been for the normal (180 wpm) speech rate, since it was preferred to either 240 or 120 wpm, and 240 and 120 wpm rates were more preferred than the extreme rates--360 or 90 wpm.

Although the story used in this study contained a certain amount of verbal redundancy, thus allowing for some discontinuity in the narration, the story was presented at the same point in as many segments as possible. For example, segment four was begun at that point in the story, usually at the beginning of a chapter, that had just ended in segment three. If this had not been done, the story at 240 wpm in the first session would have

been twice as har ahead of the story presented at 120 wpm. In addition, one tape was adjusted during segment four so that the two recordings would begin at the same point in the story at segment five. Finally, when tapes were changed between sessions, they were set to begin at the same point in the story.

In addition to the data obtained regarding each subject's operant performance, his verbal preferences were noted. This was done by recording each subject's verbalizations after his final session. He was asked, "Which one did you like the best?"

As a reliability measure, a follow-up session was administered to 18 of the 20 subjects. At this time, each subject's most preferred narrative rate was programmed together with the rates which received lesser preference. If, for example, during the course of the experimental sessions a subject had preferred 240 to the 180, 360, or 120 wpm rates, the same comparisons were again programmed. If, however, a subject had emitted responses indicative of a preference for the normal rate during the five sessions of the study, comparisons with this rate would be programmed.

RESULTS

To obtain each subject's most preferred narrative listening rate, each cumulative record for all of the sessions was individually analyzed.

A preference rate for each session was computed by subtracting the response rate per minute for the slower contingency from the response rate for the faster contingency.

For example, if during the 120 and 240 wpm comparison a subject responded at a rate of 110 responses per minute to obtain 240 wpm on accelerating conditions, but at the rate of only 20 per minute to acquire 120

wpm on accelerating conditions, his preference rate would have been 110 minus 20, or 90. If, however, the reverse had been true, a response rate of 20 for 240 wpm and 110 for 120 wpm, a preference rate of 20 minus 110, or -90, would have resulted.

These calculations were made for each subject and plotted individually to demonstrate not only the narrative rate preferred but the magnitude of this preference. The plotting was done in such a way that the faster of the two narrations compared appeared on the upper portion of the figure and the slower narration on the lower half. On both the bottom and top portions of the figure the narration rate in words per minute is plotted from left to right. The numbers on the ordinate refer to response rate differences. If the subject preferred the faster narrative rate, his preference rate difference would be plotted in the upper part of the figure; if, however, he emitted responses favoring a slower rate, his performance would be plotted in the lower portion.

An individual analysis of the results for three subjects follows, with an accompanying preference rate figure.

Retarded Child - 3 (RC-3). One of the most definitive preferences of any of the retardates was displayed by RC-3 (age 13-8, IQ 59). He responded at a very high rate for his preferred stimulus, and generally showed rapid discernment of the experimental contingencies in that he reacted very quickly to any changes between segments. RC-3, as may be noted from Figure 2, preferred 120 over 90 wpm at the rate of about 90 per minute, 180 over 120 wpm at 40 responses per minute, 240 over 120 wpm at 90 responses per minute, 240 over 180 wpm at 180 per minute, and 240 over 360 wpm at 110 responses per minute. Since RC-3 preferred the faster rates over the slower

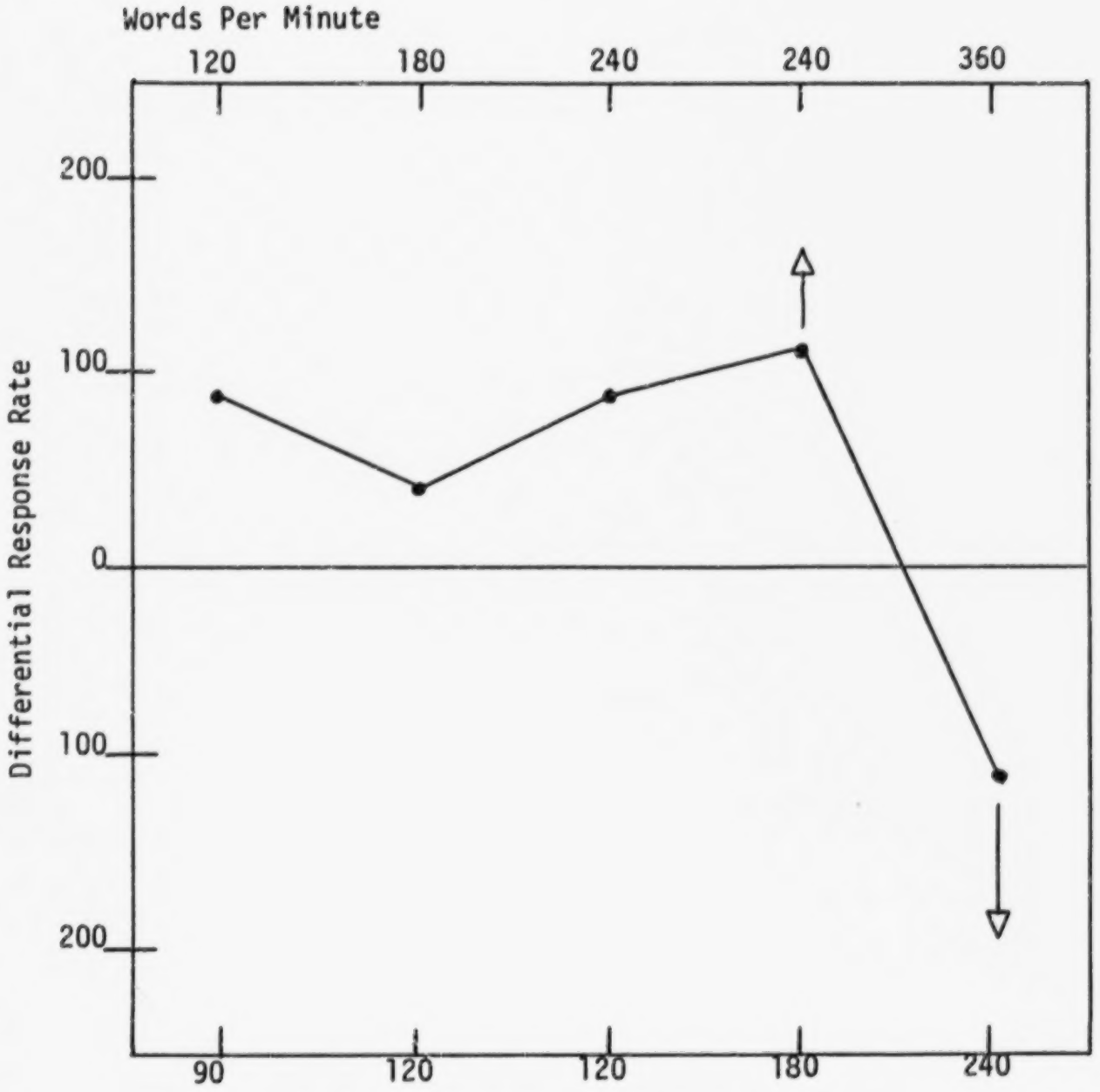

Fig. 2. RC-3's preference for speech at 240 wpm.

in all instances except the 240-360 wpm comparison, and, moreover, preferred 240 over 180, 360, and 120 wpm, this 240 wpm narrative rate would appear to be that which was most preferred. When asked about a preference, he stated an option for the faster rates that coincided with his operant performance.

Retarded Child - 9 (RC-9). A preference pattern indicative of a choice for speech at 120 wpm was displayed by RC-9. As Figure 3 indicates, he accepted all the slower rates except during the 90-120 wpm comparison, when he chose 120 over 90 wpm at less than ten responses per minute. The 120 wpm preference was confirmed by his option for this rate over 180 wpm at 60 responses per minute and over 240 wpm at 24 per minute. RC-9 also accepted the slower rates during the 180-240 wpm and 240-360 wpm sessions. He responded at a rate of 110 for 180 over 240 wpm and 48 for 240 over 360 wpm. The response rates to attain the preferred narration by RC-9 were very close to the preset response rate of 45, except during the 90-120 wpm comparison, at which time the difference rate was very minimal. RC-9 (age 11-9, IQ 79) was quite accurate in his verbalized preference, in that he stated, and actually demonstrated, a preference for slower narrative rates.

Normal Child - 4 (NC-4). A response pattern was exhibited by NC-4 indicative of a strong preference for speech at the 180 wpm rate (Figure 4). NC-4 (age 11-11, IQ 137) responded more for 180 wpm than for either 120 or 240 wpm, preferred 120 to 90 wpm, 240 to 360 wpm, and finally, during the intermediary comparison, chose 240 over 120 wpm. His response rates were quite high, as he chose 180 over 120 wpm at a rate of 221 and 180 over 240 wpm at almost this same rate. NC-4 exhibited preferences for two faster rates in emitting 115 responses more for 120 over 90 wpm and 175 responses more for 240 wpm than for 120 wpm. In addition to preferring the slower

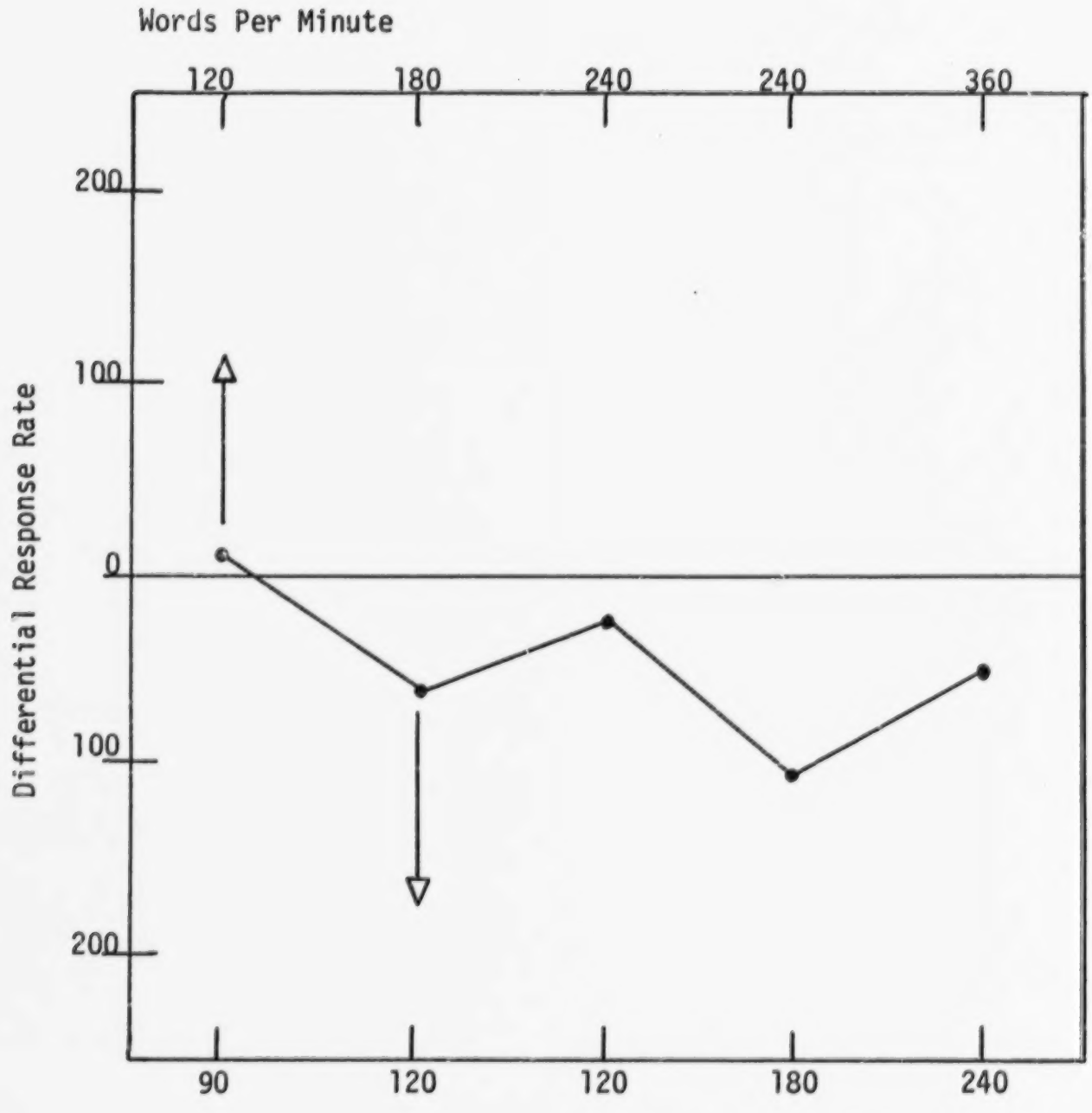

Fig. 3. RC-9's preference for speech at 120 wpm.

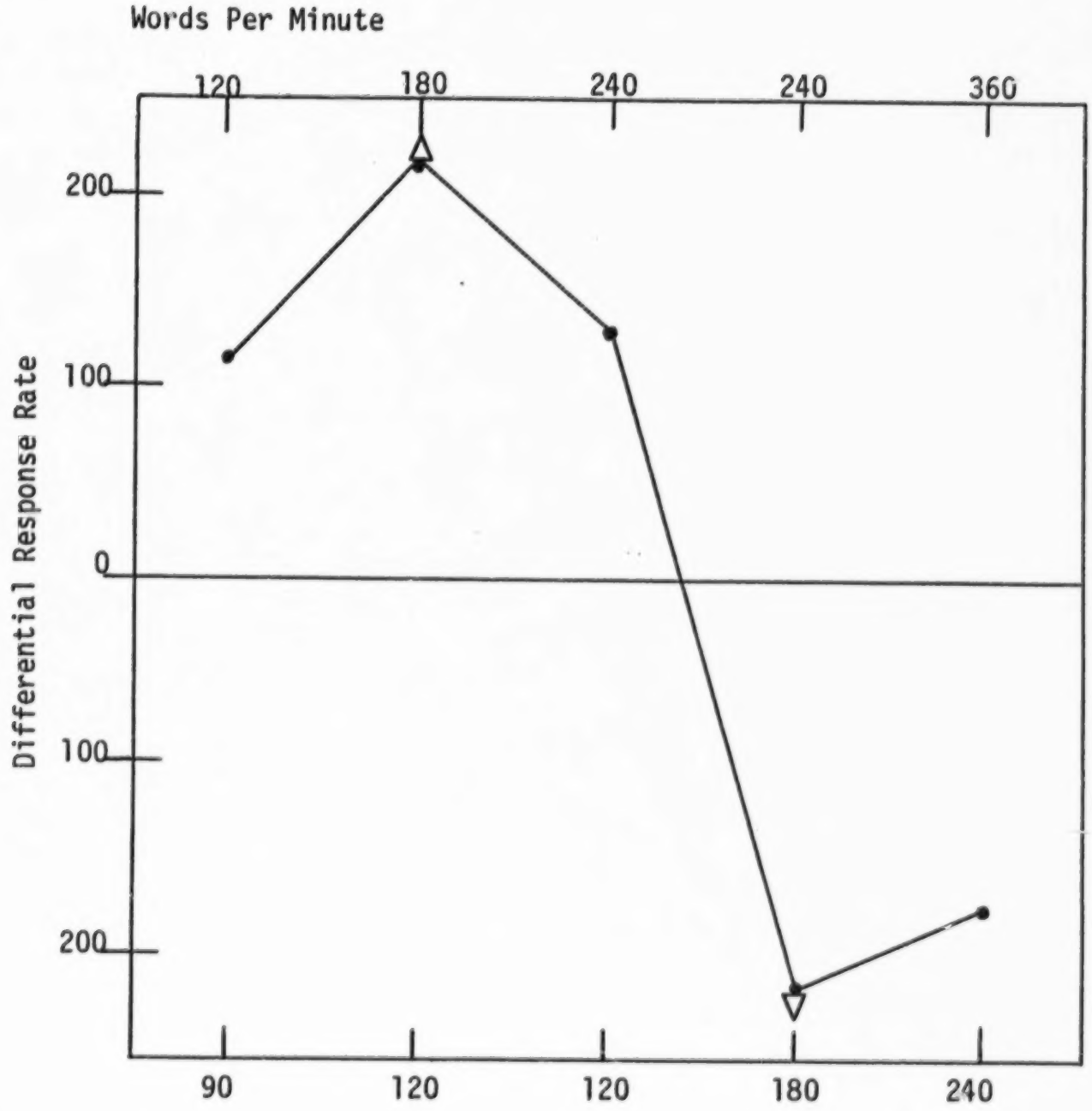

Fig. 4. NC-4's preference for speech at 180 wpm.

180 over 240 wpm selection, he also selected the relatively slower 240 over 360 wpm passage at a differential rate of 175 responses per minute. NC-4 discriminated the normal speech rate in that he verbalized a preference for it and also operated to attain it.

The group results, as represented by Figure 5, present retarded and normal subject preferences as percentages of the total population. The results show that of the 10 retarded subjects, one was a virtual non-responder, three preferred 90 wpm rates, two chose 120 wpm, three selected 240 wpm, and one chose the 360 wpm rate. Of the 10 normal boys, five selected the normal narrative rate (180 wpm), three chose 240 wpm, one chose 120 wpm, and one did not indicate a primary selection.

Individual primary preferences, as indicated by arrows, were compared to their competing stimuli by means of Chi Square analysis and were all found to be significant well beyond the .001 level of confidence with one degree of freedom.

When the verbal and operant preferences of the subjects were compared, it was discovered that eight of ten normal subjects demonstrated equivalent preference behaviors and six of the ten retarded also evidenced coincident options. When these data were applied to the Fisher Exact Probability Test, it was discovered that the preference behavior of the normal and retarded groups was not significant.

When the subject's preferences were retested, the results indicated that among the 18 subjects involved, the preferences remained nearly the same. Although the response rates of some of the subjects changed between initial and follow-up testing, only one preference was reversed.

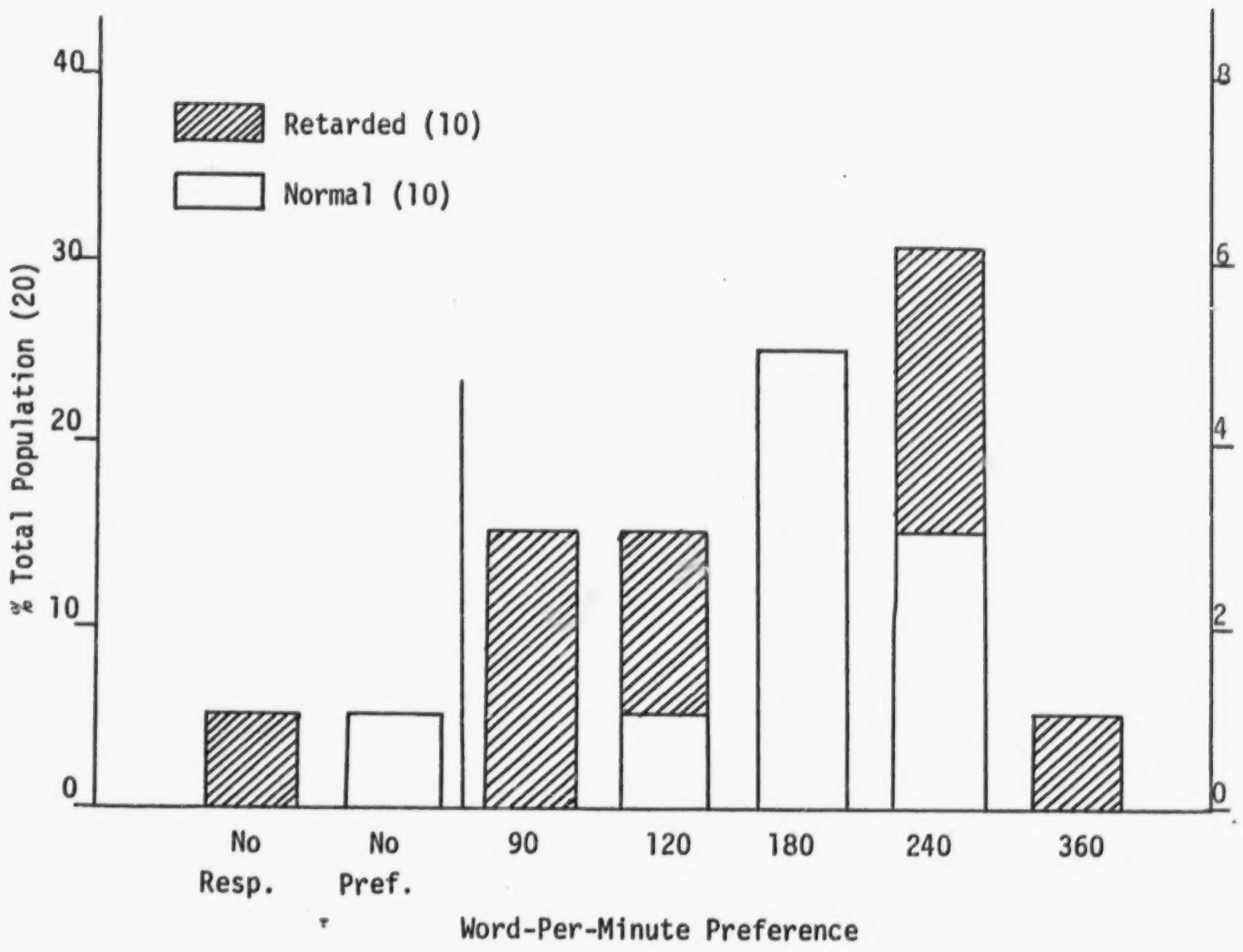

Fig. 5. Narrative rate preferences of 10 normal and 10 retarded subjects. Two subjects indicated no preference as one retarded subject did not respond and one normal subject demonstrated a mixed preference.

DISCUSSION

In the present study an application of operant-conditioning techniques and conjugate reinforcement in recording preferences for narrative rate has been made. The conjugate methodology, or the continuous presentation of stimuli, demonstrated that for all but two subjects involved in the investigation, a rather specific preference prevailed for narration at a certain rate.

Even though two subjects indicated no distinctive preferences during the experimental sessions, information was secured of a different nature. Data were obtained on the retarded subject who did not express or evidence a rate preference indicative of his inability to discriminate between stimuli and to differentiate between responses. Data were similarly gathered on the normal subject who had also failed to evidence a singular narrative preference. This subject, unlike his retarded counterpart who had evidenced no preferences, displayed an operant preference during each of the five experimental sessions, but these selections were not consistent with one another. He selected a fast rate, 240 over 180 wpm, at one time, and a slow rate, 120 over 240 wpm, at another. During retesting, however, he emitted responses that indicated a preference reversal in that he selected the 240 wpm rate over either 180 or 120 wpm, thus evincing a consistent option for the faster narrative rate.

The research further substantiated the finding, initially observed and reported by Morgan and Lindsley, that a discrepancy may exist between operant and verbal preferences. Although statistical analysis revealed this discrepancy to be no more pronounced for retarded than for normal subjects, six boys from the total population displayed measured preferences that were

in some way deviant from their verbal selection. Therefore, the results of measuring preference for potentially available stimuli were, for these six individuals, quite different from the results of a method in which the subject actively consumes the stimuli.

A further advantage of the conjugate technique in assessing individual responses lies in the field of measuring nonverbal behavior. Often, in an evaluative setting, when the purpose is to assess nonverbal skills, verbal instructions are given: how to operate the manipulandum, where to look, or when to press the button. In experiments where verbal communication is an integral feature of the research design, the exact comprehension behavior of the subject in regard to these instructions is difficult to ascertain. The matter of differential comprehension and its subsequent effect on performance, in instances where extensive verbal instructions are given, often serves as a confounding variable and may account for much of the variance found in many research efforts. Therefore, instructions given each subject to determine narrative rate preference were kept very brief: "Here is a hand switch; you may press it if you want to." The subjects were told nothing about making a discrimination or preference, nor given any information as to the conditions or contingencies of the one-operandum conjugate technique, and were not asked to interpret or explain their behavior until the sessions were completed. Since verbal instructions were minimized, it can be stated with reasonable certainty that the individual's recorded preference was a function of the stimulus control of the narration rate and not of his misunderstanding the verbal instructions or being subject to either examiner or peer influences.

Educational Implications

The results of this study, as far as the obtained preferences of the normal subjects was concerned, were none too surprising, since half of these normal boys preferred the normal rate. The four normal boys who preferred rates other than normal chose either 120 or 240 wpm. In all cases the extreme narrative rates, 90 and 360 wpm, were rejected.

The operant preferences of the retarded boys were quite unexpected, since they totally rejected the normal rate of speech. Of the five possible narrative choices available, the retardates, as a group, selected all rates but the normal presentation. Unlike the normal boys, who had rejected the extreme rates, three of the retardates selected the 90 wpm rate and one the 360 wpm rate.

If future research substantiates the findings of this investigation that retardates 10-14 years of age tend to reject the normal rates, or that this phenomenon is demonstrated by younger and older retarded subjects, we may need to investigate the verbal topography of our public-school classes for the mentally retarded.

Since each subject's past narrative reinforcement history is unique and has presumably shaped and maintained his current preference, future research as to the verbal behavior on the part of teacher and students in special classes may be a contributory factor. Thus, in part, we can account for the retardates' rejection of the normal rate.

On the basis of the present investigation, then, the educational implications seem to be fourfold:

(1) Classes, particularly those in language arts, could be grouped on the basis of narrative rate preferences. If we continue to find a rather

large number of retardates who seem to prefer speech at rates less than normal, much of their aural material should be presented at that rate.

(2) If we envision the day of extending machine teaching into the classroom, we could conceivably program each individual at his most preferred speed. Tapes could be made for those who preferred speech at 240, 120, or any other desired rate.

(3) We may find it profitable to shape or modify preferences, particularly if we continue to find that many of the retardates continue to reject the normal rate. We may desire to alter the listening behavior of the retardate who prefers speech at either the slower or the faster rates toward a more normal preference. The possibility exists that for some of these retardates who reject the normal rate much of the auditory stimuli bombarding them is, to say the least, none too pleasing and may perhaps be nothing more than sheer noise.

(4) Finally, if any child's narrative rate preference is to be either maintained or modified, we should be cognizant of his concomitant comprehension skills. If an individual's rate preference is such that modification procedures seem unwarrantable, it is probable that appropriate contingencies might be established to enhance his comprehension. If, however, rate-modification techniques are instigated, a coincidental program could be arranged to obviate gross comprehension losses.

That the listening process is subject to modification has been amply demonstrated by such researchers as Irvin (1953), Heilman (1950), and Erickson (1954). These investigators reported that the listening comprehension of college students improved as the result of a systematic listening program when narrative rate was a stable element. Orr and Friedman

(1964) provided further evidence concerning the dynamic aspect of listening when they reported that the comprehension of college students remained unaffected when they were trained to listen to increasingly faster rates of narration. Foulke (1964b) has reiterated the importance of training individuals to accommodate more rapid rates of narration, by commending high-rate listening as a top priority research project.

Research Implications

As is the case with much exploratory research, this investigation has raised several interesting research possibilities.

Although this study has shown that most individuals are stimulated by narrations at varied rates, there still exists one rate that is preferred above all others. Since differential preferences exist for the dimension of rate, as determined by past narrative reinforcement histories, we might similarly expect individual differences in the many other aspects of narration.

It would be of scientific interest to assess these other parameters of the narrative complex in a choice or preference paradigm. Inasmuch as most subjects seem to prefer one rate over another, it is possible also that speaking style would be another important dimension to measure.

It is also likely that some subjects prefer stories at a certain volume in preference to other levels of intensity. We may perhaps find some who desire stories at a very soft level and others who prefer a greater decibel output.

In addition, we may find some kinds of interaction in operation. Perhaps some will prefer certain stories, read by specific types of readers,

at certain levels of intensity. These same individuals may, however, be more reinforced if other types of narration are supplied by yet another reader, at another rate, and at a different intensity.

A final area of research interest would be to determine individually the difference between a subject's narrative rate preference and his optimum comprehension rate. That these two behavioral aspects are not one and the same has been reported by Foulke et al. (1962) when they observed that, though as a group the blind children in their investigation began to experience a significant comprehension loss at 275 words per minute, the comprehension of some individuals was affected a great deal more at the higher rates than was the comprehension of others.

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ORAL READING, SILENT READING, AND SPEAKING RATES OF NORMAL AND RETARDED MALES

In an earlier study (Lovitt, 1966) a determination was made of the preferred listening rates of a group of young normal and retarded boys. The results of the investigation showed that by presenting the same story to these subjects at five varying word-per-minute rates (90, 120, 180, 240, and 360 wpm) the majority of the normal subjects indicated a preference for speech at a 180 wpm rate. The retardates, however, all rejected this median, 180 wpm rate, and selected rates either faster or slower.

Many researchers have commonly referred to speech rates of from 170 to 180 wpm as the median or normal rate of speech. Other investigators, concerned with the effects of varying rates of speech on comprehensibility of material, have also referred to these rates as the normal speed of speech (Foulke et al., 1962; Spicker, 1963; Orr & Friedman, 1964).

As a companion investigation to the listening rate study, the current investigation was designed to assess three additional communicative elements--oral reading, silent reading, and speaking, with primary research attention centered on the relationship, if any, of the four communicative variables--preferred listening, oral reading, silent reading, and speaking rates. For secondary consideration, a detailed analysis of the speaking rate of each subject was planned, which would provide further information concerning every subject's over-all word-per-minute rate and data relevant to individual duration and variability of speech.

Duration of speech as a function of examiner prompts was considered an important variable in the investigation in that it is conceivable that num-

ber of words spoken is related to speed of utterance. Pickett and Pollack (1963) reasoned that vocal patterns consisting of short phrases result in slower speech rates than verbalizations consisting of several words. Relevant to such discussions of speech duration was the research question of whether one type of stimulus prompts speech duration for a longer period than that prompted by another stimulus type. For example, one subject, when asked to speak about a story he has just read, may verbalize for three minutes. However, when asked to relate the happenings of a typical school day, the same subject may speak for one minute only, while another subject may respond in an entirely different manner to identical antecedent prompts.

Variability was selected as a second important area for an investigation of the speaking process. These variations may occur as either a steady, unbroken stream of words or as a series of intermittent bursts of speech separated by long pauses. In response to questions concerning his activities on a typical school day, for instance, one subject may speak in a smooth, rapid manner when describing certain activities, and in a slow, intermittent manner when relating other incidents. Another subject, however, may speak in a smooth, flowing manner regardless of the type or occurrence of the antecedent prompt.

METHOD

Subjects

The subjects in this experiment were ten normal and nine retarded boys from the public schools in Northeast Johnson County, Kansas. All the subjects were between the ages of ten and fourteen and were free of major hearing or visual impairments.

The retarded subjects were from the Roesland and Hickory Grove Elementary Schools and from the Hillcrest and Meadowbrook Junior High Schools. These boys ranged in age from 10-0 to 13-10, with a mean CA of 12-2. Their IQ's, obtained from the Stanford-Binet Intelligence Test or the Wechsler Intelligence Scale for Children, were from 50 to 88, with a mean of 71.

The normal subjects were from Nallwood Junior High School, or the Trailwood or Santa Fe Trail Elementary Schools. Their age range was from 11-11 to 12-8, with a mean of 12-3. The IQ scores for the normal boys, obtained from Otis group assessments, ranged from 114-137, with a mean of 121.6.

Procedure

Each session provided an assessment of each of three communicative variables: (1) oral reading, (2) silent reading, and (3) speaking. At the beginning of a session the examiner explained the three part task to each subject: reading aloud, reading silently, and finally, relating the content of both readings.

For an assessment of each normal subject's oral reading rate, a passage from the book Flaming Arrows by John Steele (1957) was selected. After a period of five minutes the subject was asked to circle with a pencil the last word he had read and to continue reading the selection silently. At the end of a second five minute period, the subject again was asked to circle the last word read.

Each normal subject's speaking rate was measured as he was asked to relate that portion of the story he had read silently. When the subject said either. "That's all I remember," or remained silent for a period of

ten seconds, he was given the second verbal prompt, "Tell me as much as you can about a typical day at school." A third verbal prompt was given after another ten second period of silence, or a response indicating that the subject could tell no more. This final request asked the content of the orally read passage. This procedure supplied the examiner with at least three minutes of speech from all but one subject.

In order to gather similar data from the retarded subjects, the same general procedure was used. Unlike the normal boys, however, who read from the same text, the retarded subjects were asked to bring to the recording session the reader they were currently using. These readers ranged from primers to sixth grade texts. Oral and silent reading rates of the retardates were, therefore, based on a variety of reading material.

A further departure from the procedure used with the normal subjects was necessitated as speaking rates were assessed. Initially, the examiner attempted to limit his requests to the same three prompts used with normal boys; however, with some retardates, three minutes of speech were not acquired without the use of many additional prompts. In addition, prompts not related to story content or school activities encompassed, of necessity, such topics as families, pets, summer or weekend plans, in order to meet the three minute speech requirements.

A tape recorder was in continuous operation during each oral and speaking session with each subject. Immediately following a session, each boy's silent and oral reading rate were calculated by counting and dividing by five the number of words read from the text. Speaking rates were obtained by counting each word from a written transcription of each subject's recorded speech and dividing by the number of minutes this narration lasted.

Single syllable or part-word dysfluencies were not counted as words. For example, if the subject said g-g-girl only one word was counted. However, if whole word dysfluencies occurred, such as girl-girl-girl, he was credited with three words.

To obtain duration of speech as a function of specific examiner prompts, the number of verbal emissions was counted separately following each examiner stimulus. Three duration measures were obtained from all of the normal subjects, while as many as seven were obtained from individual retarded subjects. On the basis of these duration counts, a composite duration-ratio was obtained by dividing the total number of words emitted during the speaking segment of the session by the number of examiner prompts.

To assess the variability of each subject's speech, his recorded oral reading and speaking were programmed at a later time through a Voice-Operated-Relay (VOR). The VOR, which is activated by each vocal stress, has proved a useful tool in the analysis of speech rates. A visual record may be supplied by linking a cumulative recorder with the VOR, as each vocal stress is recorded by an upward movement of the pen, while a horizontal pen movement indicates no response. If a subject read or spoke in a steady, continuous manner the corresponding graphic record would appear as a steep, steady line. If, however, a subject responded with slow bursts of speech followed by long pauses, his cumulative performance would show as a gradual slope accompanied by horizontal lines.

The vocal analysis, as obtained by the VOR and cumulative recorder, more closely resembles utterance rate of phonemes or syllables than that of words. If, for example, a subject said, "He is there," the VOR is activated

three times. For another three-word-phrase, however, with poly-syllable words as in "Stanley doesn't communicate" the relay is activated a total of eight times.

RESULTS

Table 1 provides each individual's oral reading, silent reading, and speaking rates as obtained from the research reported herein, and the individual preferred listening rate obtained in the earlier investigation.

TABLE 1

Individual Rate Performances

	Oral Reading	Silent Reading	Speaking	Listening
Retardates				
RC-1	52	66	127	*
RC-2	74	88	135	120
RC-3	*	*	*	240
RC-4	65	95	152	360
RC-5	65	68	93	240
RC-6	105	117	95	90
RC-7	52	49	35	90
RC-8	65	59	99	240
RC-9	66	86	90	120
RC-10	128	193	107	90
Normals				
NC-1	169	180	219	240
NC-2	165	258	122	240
NC-3	175	280	162	240
NC-4	135	198	127	180
NC-5	178	175	188	180
NC-6	136	309	128	240
NC-7	138	176	114	180
NC-8	159	155	150	180
NC-9	182	246	150	180
NC-10	150	195	138	120

* No Data Obtained

Table 2 provides group information concerning the oral and silent reading rates and speaking rates of the normal and retarded subjects. Preferred listening rate data are included here also. These data reveal that for all four measures, the mean rates of retarded subjects are lower than those of the normal subjects. The mean silent reading rate for the normal boys was 217 wpm; that of the retarded boys, 91 wpm. The oral reading rate of 159 wpm and speaking rate of 149 were also more rapid for the normal students than the corresponding rates of 75 and 104 obtained from the retarded subjects. The mean listening rates of the retardates were correspondingly lower, as 177 wpm in contrast to the 198 wpm mean rate of the normals.

Moreover, while all of the communicative performances of the retardates were lower than corresponding rates for the normal subjects, the group rates represented a very similar variability. The silent reading rates for the retardates were from 47 to 193 wpm or a range of 146, while the normals read from 155 to 309 wpm--a range of 154. The retardate oral reading rates were from 52 to 128 wpm with a range of 76. The corresponding normal oral rates

TABLE 2

Group Rate Performances

	Oral Reading		Silent Reading		Speaking		Listening	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Normal	159	135-182	217	155-309	149	122-219	198	120-240
Retarded	75	52-128	91	47-193	104	35-152	177	90-360

of from 135 to 182 demonstrated a range of 47. The speaking rates of the retarded subjects ranged from 35 to 152, a difference of 117, while the normal boys spoke at rates of from 122 to 219 or a range of 97. The normal listening rates ranged from 120 to 240 while the retardates chose listening rates of from 90 to 360.

When duration ratios were calculated by dividing the total number of words spoken by the number of examiner prompts, ratios of from 34 to 247 were obtained from the retardates, with a mean of 98 wpm. The duration ratios of the normal subjects extended from 162 to 338 with a mean of 231 wpm.

A detailed rate performance analysis ot two retarded and two normal subjects follows. These records were selected not as representative of other subjects in the two groups, but as examples of the variability of subjects in the four rate variables--silent reading, oral reading, speaking, and listening.

Retarded Child Number One (RC-1). During the silent and oral reading session RC-1 used his current text, the primer Up and Down the Street. As Table 1 indicates, his silent reading rate was 66 wpm, while his oral and speaking rates were respectively 52 and 127 wpm. When a duration ratio was calculated, by dividing RC-1's total speaking output of 505 words by the six examiner prompts, a figure of 84 words per prompt was obtained.

Figure 1 is a representation of RC-1's vocalizations while reading orally and speaking as indicated by a cumulative record when programmed by a VOR. Contrary to most of the normal subjects, RC-1's speaking rate was more rapid than his oral reading rate. The fact that both lines, reading and speaking, are equally grainy and variable indicates that this subject's verbal flow, or continuity of speech, was similar whether he read orally or

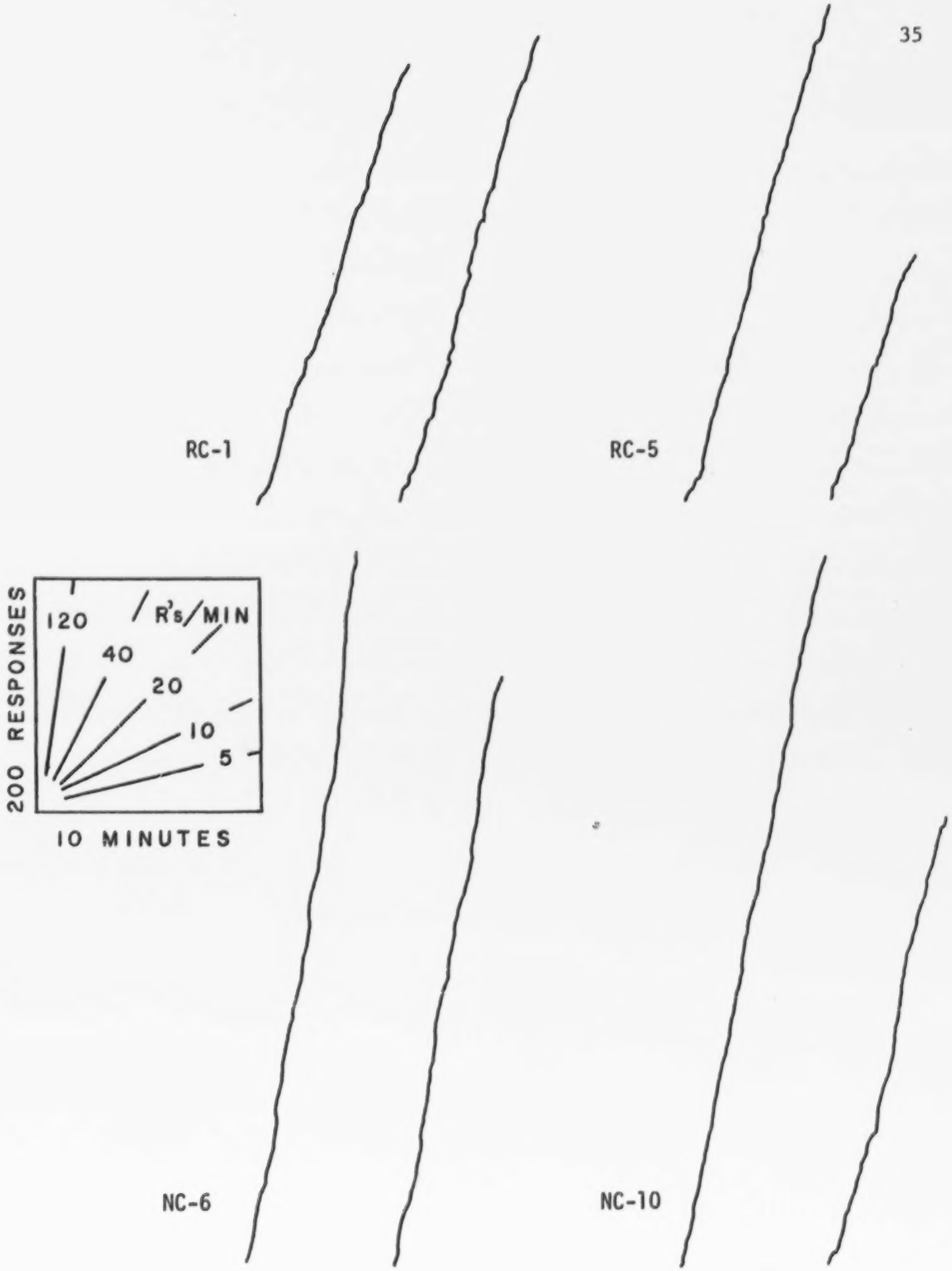

Fig. 1. Cumulative record of the oral reading and speaking of four subjects when programmed by Voice-Operated-Relay. The left line represents the oral reading rate while the right line the speaking rate.

spoke. In this aspect, RC-1's performance approximated the performance of many of the normal subjects.

During the initial investigation of preferred listening rate, RC-1 was the only subject who failed to respond in a manner indicative of a preference for a specific rate of speech. His responses were relatively undifferentiated, regardless of whether slow, normal, or fast narration was programmed.

Retarded Child Number Five (RC-5). Silent and oral reading rates were obtained from RC-5 as he read from the first grade Ginn reader, On Cherry Street. His silent rate was 68 wpm, while his oral reading rate and speaking rate were respectively 65 and 93. RC-5's preferred listening rate as obtained from the prior study was 240 wpm.

This retarded subject's total word output during the speaking session was 205 words. When this was divided by six, the number of examiner prompts a duration ratio of 34 was obtained. Although three minutes of continuous speech from each subject had been planned originally, RC-5 was so reluctant to verbalize that only 130 consecutive seconds of speech were acquired.

Figure 1 depicts his oral reading and speaking rates as indicated by the VOR. Like RC-1, RC-5's speaking rate was more rapid than his oral reading rate. Unlike RC-1, however, RC-5's speaking performance, as indicated by the VOR, was more irregular than his reading rate, indicating more variability and less continuity while speaking than while reading orally.

Normal Child Number Six (NC-6). For all normal subjects, silent and oral reading rates were obtained as they read from the same juvenile fiction. NC-6's silent and oral reading rates were 309 and 136 wpm. His silent reading rate was the highest of all the subjects, while his oral reading rate was next to lowest of all the normal subjects.

The speaking rate of NC-6 of 128 wpm was about half the 240 wpm speed of his preferred listening rate. This speaking rate represented one of the slowest of the normal group, whereas his preferred listening rate of 240 wpm was one of the faster rates selected by normal subjects.

A duration ratio of 165 words was obtained when NC-6's total 495 word output was divided by three examiner prompts. Further extreme rate performances were displayed by NC-6 as his duration of 165 was the next lowest of all the normal boys. Further, it is interesting to note that this variable performance was from a subject with the highest recorded IQ of any of the boys participating in the study. It may be noted from Figure 1 that NC-6's oral reading rate is very rapid and continuous while his speaking rate is less smooth and more intermittent.

Normal Child Number 10 (NC-10). The oral and silent reading rates for this normal subject were 150 and 195 wpm. Both these rates were near the mean figures (159 and 217 wpm) of the normal group.

NC-10's speaking rate of 138 also closely resembled the group mean rate (149 wpm). The duration ratio of 197, as calculated by dividing his total 590 word output by the three prompts, proved to be more discrepant from the normal group average (231) than were his other rate performances. Further deviation of NC-10 from normal group performance was recorded in the rate investigation where he selected a rate slower than normal.

Although Table 1 points out that NC-10's speaking rate is slightly slower than his oral reading rate, the two rates differ widely in terms of variability. As Figure 1 indicates, his oral reading performance was steady and smooth, whereas his speaking rate was sporadic and intermittent.

DISCUSSION

The most striking feature which emerges from an analysis of the data is the relative lack of consistent performance between or among groups. These inconsistencies are impressive when they are compared to the assumptions of consistencies for certain classifications of children which are made in applied areas of teaching and diagnosis.

Though the normal subjects had relatively higher rates than did the retardates, larger differences existed between scores within groups than between groups. For example, in listening and speaking, some retarded subjects had faster rates than did some normal subjects. One retarded subject, moreover, read silently at a faster rate than did four of the normal subjects.

On the basis of this investigation the data seem to indicate that each communicative parameter--reading, speaking, and listening--is under different stimulus control. If, in fact, each dimension of communication is controlled by different stimuli and subsequently is altered by various different stimuli, the idea of a slow or a high rate overall categorization of an individual would not seem to be based upon adequate research.

With evidence that each parameter of speech is under the control of different stimuli, and that little relationship exists between many of these dimensions of a correlative nature, the diagnostic implications are obvious. The maladaptive behavior of an abnormal or retarded subject may be partially a product of his communicative processes. For example, if a subject's reading, listening, or speaking rate is so discrepant from normal that his receptive or expressive facilities interfere with communication, an attempt should be made to alter the specific deviant behavioral dimension. The

evaluation of this deficit, however, is only the first step toward the process of alteration. Delimiting the deficit area is one step, but additional steps are necessitated in ascertaining the stimuli that control any of the communicative dimensions.

It may be determined with some disabled readers, listeners, or speakers that their reading, listening, or speaking responses are under the control of stimuli not always believed relevant in the public school training situation. For instance, a thorough behavioral analysis may determine that a particular child's listening preference may be brought under control, leading to subsequent alteration, by manipulating the intensity or timbre of the input narration. It may be determined further that a child's silent or oral reading is controlled and altered by modifying the size or intensity of the print. Correspondingly, a penetrating behavioral analysis of the child with a speaking rate deviation may reveal that his abnormally slow or fast rate of speech is a function of the number of words he emits. Prior research has indicated that the mean sentence length of the retardate is lower than that of the normal child. On the basis of this data, researchers (Pickett & Pollack, 1963) have made a physiological case stating that the fewer words-per-utterance, the slower the speech, and conversely, the more words emitted, the faster the rate. The present study would lend some support to this statement in that the duration ratios of the retardates, a function of both total word output and examiner prompts, were much lower than for the normals. Concurrently, the speaking rates of the retardates were lower than those same rates for the normals. This being the case, if an individual's mean sentence length is the controlling stimulus for his rate of speech it would seem appropriate to alter his sentence length to control his rate of speech.

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